

bute so much to the beauty of the wood, where they exist, do so to some depth. The Honduras mahogany holds with glue better than any other wood; the annual rings are not very distinct; there are no larger transverse septæ, but the smaller are frequently rendered very visible by their compactness being set off by the porous texture of the intervening parts of the wood; the wood is tasteless and inodorous.

71. The Spanish is imported to this country in logs from 10 to 12 feet long, and sometimes 26 inches square; the Honduras 15 feet long and occasionally 5 feet square. It is seasoned by exposure to the weather during a winter, then sawn out and dried in the open air under cover; fire-drying should never be resorted to. Of all woods it warps and twists the least, and it shrinks almost as little; on this account there is a considerable consumption of it in the factories, in making machine-framing; by long steeping in cold water it loses less weight than many other woods.

72. WALNUT. This tree is a native of Persia and the north of China, and is said to have been introduced into this country by the Romans. It was formerly propagated here to a considerable extent, on account of both the timber and fruit, the former having at one time been very generally used for furniture, for which it was held in high estimation; now, however, and indeed since the introduction of mahogany, its cultivation has greatly declined, and what remains and is yet grown is so much enhanced in value by the great consumption of it in gun-stocks, handles of cutlery, &c., as to make it too costly for general purposes; it is, notwithstanding, still made available in the cabinet-maker's art, being highly prized by many, who prefer its varied and rich brown colour to that of the more uniform mahogany. Though not indigenous to this country, as may, from its growing so freely, ripening its seeds so perfectly, and being so well established, consider it as naturalized to our climate, that is to the southern part of it. A rich loamy soil is best suited for it, but it will grow well nevertheless in one of a stony description, especially if a thin limestone, or consisting partly of chalk. There are considerable plantations of it on the chalky downs of Surrey. In the midland and southern counties generally it thrives to full perfection, but so far north as Edinburgh, though it grows with vigour and to an ample size, its fruit does not reach its full degree of ripeness. It is a large and handsome-looking tree, with a lofty and generally well-balanced head, and limbs thick and spreading, forming, when aged and well-grown, an imposing and picturesque object, having a light-coloured and deeply-furrowed bark and graceful, though light and short-lived foliage. The latter comes late, goes early (in fact, it is the soonest stripped), and is never very luxuriant; the leaves are small and oval, set on the stalks in pairs, and of a bright yellowish green, contrasting advantageously with adjacent foliage of a darker shade. It is raised readily from the nut, which is, in February, sown where it is intended to remain; it may be transplanted when considerably grown, but ought not to be so if meant for timber. It is now chiefly regarded as a fruit-tree, the unripe nuts being in June, when the inner woody shell is not yet formed, converted into an excellent pickle, and those which are allowed to ripen, being probably the best fruit of the nut kind that the country produces; the inhabitants of some districts on the Continent make it fulfil an important part as an article of food; it affords an oil which, when first drawn, is little inferior to that of the olive, and the bark, leaves, and roots furnish an intense brown dye, which is permanent on woollen articles without a mordant.

73. Its wood is too limber for beams or joists; besides which, for purposes where a weight has to be sustained, it is rendered unfit by a brittleness and liability to split. It was, nevertheless, employed by the ancients for building-purposes; Pliny bears evidence to its possessing the good property of giving warning by crackling before it breaks (being thus just the opposite of the lime-tree), and it cannot be denied that it has the redeeming qualities of durability, little shrinkage, and, more than all other timbers, the cedar alone excepted, non-liability to the ravages of worms or other insects, which must point it out as advantageously adapted for joinery, parquet floors, &c., could the supply

be sufficient, and were the cost reasonable. It is, moreover, exempt from those chemical principles which operate on the fine polish of superior steel instruments, for which reason it is peculiarly adapted for surgical cases or the repositories of other superior cutlery. The colour of the heart-wood is a greyish brown, with dark brown pores; that of the sap-wood a greyish white; the annual rings are not very distinct, and there are no larger transverse septæ; it is not flowered, but often richly veined, and interspersed with shades of lighter brown and of black; being susceptible of a high degree of polish by oiling or otherwise, it is capable of receiving a fine and brilliant finish. Trees grown on dry and rather poor soils have afforded examples of the most beautifully veined wood; and the roots, which are even more finely and variously veined than the trunk, furnish an elegant material for superior and fancy work. Its texture is not so uniform as that of mahogany, one side of the annual ring being more porous than the other; neither is it quite so easy to work as that wood; but that disadvantage is compensated for by the superior surface which it takes; it is slightly bitter when green, and emits a perceptible odour.

74. The Hickory, or White—and the Black-Virginian Walnut, are both indigenous to North America. They are both large trees and furnish respectively very useful woods, that of the latter being considered the finest, and indeed the most valuable of its species, having very fine veins and a close grain, affording facility for a high polish; it has also the other desirable qualities in common with the ordinary walnut above described. The wood of the young hickory is tough and flexible to a high degree, and is excellently adapted for lances, fishing-rods, &c. It is not imported as an article of commerce, but is used, split into billets, for the stowage of casks in ships. Some of these American species have been introduced here, but they are not yet sufficiently naturalized to warrant any decided opinion on their merits. Walnut, loses by long steeping in cold water less weight than some other woods.

(To be continued.)

ON THE CONDUCTING AND ABSORBING POWERS OF ROCKS AND STONES.

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It is taken for granted by chemists of the day that the duration of rocks, when applied to building purposes—is demonstrated by their conducting and absorbing powers; and that therefore the Builder, in the choice of his materials, where durability is concerned, should always regulate his choice accordingly. These notions, borne out by experiment, are, in numerous instances, perfectly correct in detail; but are much too general in their nature to be received by the plain, practical, or observing man, without some further observation. The composition, and consequently the characteristic qualities, of stone, is perpetually fluctuating, presenting itself under different aspects, even in the same quarry; so that, when we speak of Portland or Bath stone, Yorkshire flag, or Aberdeen granite, we necessarily embrace numerous varieties, some of which are wholly inapplicable to building purposes.

All rock, while it remains a natural constituent of the earth, maintains to the greatest extent consonant to its nature, an equilibrium of its forces, not otherwise disturbed than by excess of heat, or local chemical action. Its absorbents, like those of the tree while living, are incessantly occupied by the juices abstracted from the earth; and if those juices embrace the simple elements of water alone, age upon age may pass away, and the rock will undergo no perceptible change; but if those juices embrace saline solutions, or gaseous bodies, and these are conveyed into the cellular texture of the rock, or are made to embrace the several atomic parts of the concrete mass, then, a sore and certain change, no matter how slow that change may be, must take place under any condition or climate; and the nature of the agents and the aggregate masses acted upon determine the ultimate result.

There is a much greater resemblance between the concrete and crystalline mass and the organic body than physiologists are disposed to admit; for all varieties of rock

have absorbents, lobule and exhal, and go through processes analogous to those which contribute to add strength and solidity to the organic frame. All rocks are permeable and are permeated by heat and moisture; and, according to their disposition upon, or within the surface of the earth, have a slow uniform action, the result of uniform action exercised upon them; they are all compounds of compounds, sums of lesser magnitudes united to each other by some one common cementing base, and not of necessity the same substances, for many rocks present phenomena very complicated and widely differing from each other. The surface portion of crystalline rock, exposed to the atmosphere, is always the hardest, and the gradual transition from crystalline structure to even the pasty state, is far from being an uncommon occurrence. Granite invariably softens as it is removed from atmospheric influences; marbles assume a higher crystalline structure, and concretes having a siliceous base become more densely consolidated in their parts: the reasons are obviously the same in all; the absorbent pores being gradually filled up with matters analogous to the crystalline, or amorphous structure. The Oriental seem to have been well aware of this; for to procure those magnificent stones so common to their temples, palaces, and sculptured monuments, they quarried into the bowels of the mountains, from whence they obtained the stone in a much softer state than it existed on the surface soil, and in those truly colossal dimensions which have rendered their admiration of after-ages.

Every variety of rock has a tendency to assume the solid state, but no one of the numerous varieties ever attains solidity; they have all absorbing powers, they have all capabilities of further increase of solidity; the nature of their earths and of their compounds determining their powers of increase, and defining the limits beyond which it does not appear they can possibly pass: thus it is we have definite compounds, as porphyry, granite, and marble, each of which presents phenomena peculiar to its kind, all deviations of which constitutes variety. These well-known demonstrable facts are invaluable; first, as initiating the practical man into the *modus operandi* of nature; and secondly, as removing vulgar errors, such as that crystalline rocks are fused masses, and could only be formed under intense lateral pressure.

When the stone is quarried, it becomes immediately the passive subject of new affections, no longer deriving its invigorating juices from the earth; and, exposed to influence of the atmosphere alone, the continuance of its absorbent powers depends entirely upon its own nature and mechanism, and the atmospheric influence. Bath stone, when quarried, is a soft, cohesive, ponderous mass, intimately united, but readily separable in its parts, and to a certain extent uniform in composition though of a texture much more varied than Caen stone and many other kinds. When applied to building purposes, its excess of moisture passes off by evaporation, and its spongy cellular texture exposed to atmospheric air, gradually acquires greater rigidity of parts, but still retains its great absorbent powers, and consequently its susceptibility of accelerated chemical action, which induces decay in a much more rapid manner than can take place in stone of denser structure; and although its absorbent power may not equal that of soft malm-bricks, it is far less durable than the latter, when both are exposed to equally corroding influences, as may be seen in countless existing buildings. The stone of Malta, forming the base and almost the sole composition of that island, is of a similar nature, but even more porous after exposure to the atmosphere; it is a coral formation commingled with sand, upon which the ocean-waters, by carrying into the absorbent vessels, have no other effect than to increase its solidity, until it attains the state of limestone rock.

Portland stone is exceedingly varying in its qualities, for we find it sometimes highly consolidated with silica, at other times with silica and alumina, and very often a mere concrete, and but slightly held together by some not general base; its powers of absorption are consequently extremely fluctuating and uncertain, and the extent of durability very contradictory, for, while one portion of a structure built of this material has stood the test of ages, another has scarcely seen one generation pass away ere it has decayed. Magnesian lime-